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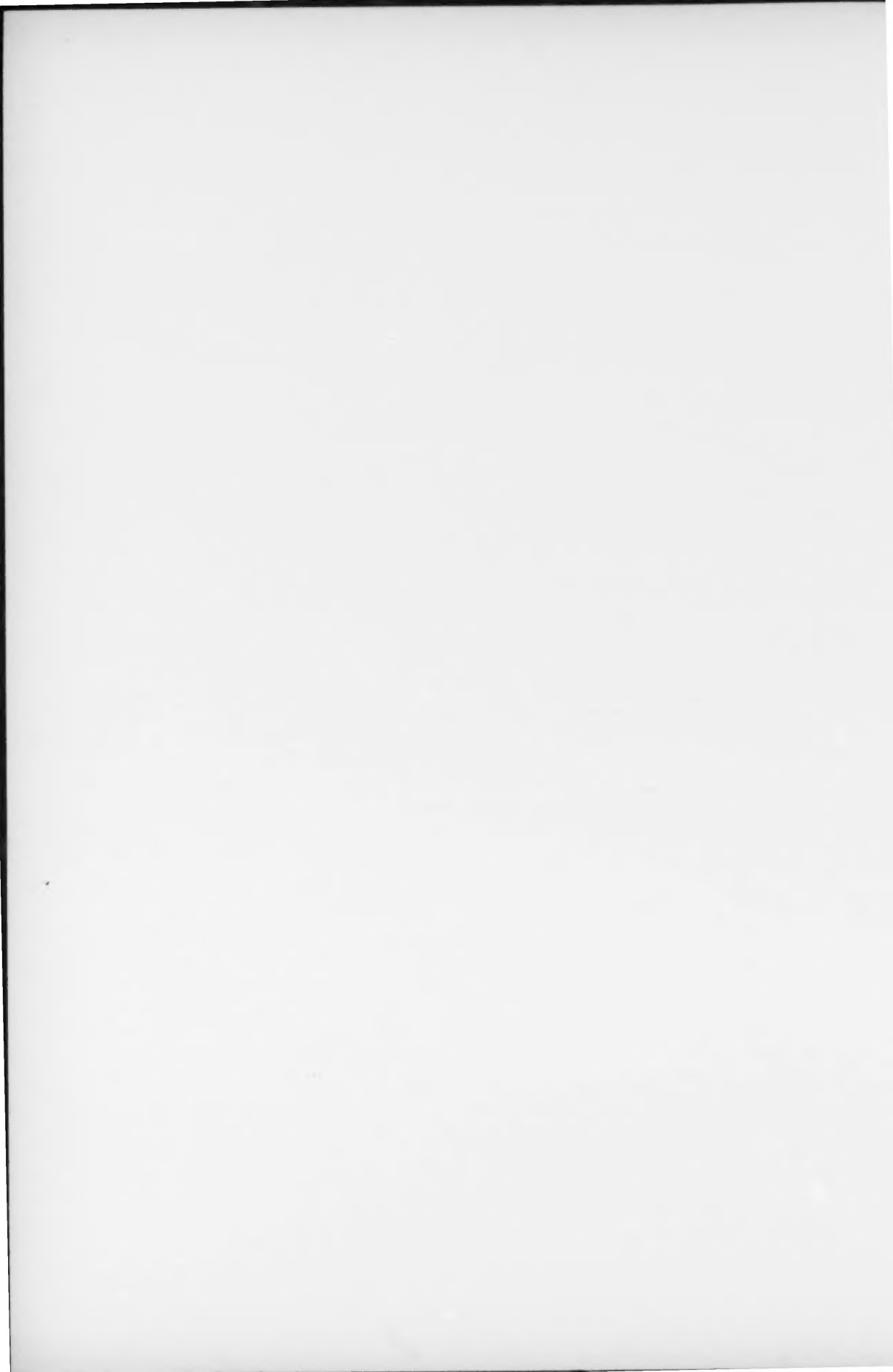
In Re RALPH E. BUCKNAM

Petition for Writ of Certiorari
to the United States Court of Appeals
for the Federal Circuit

PETITION FOR WRIT OF CERTIORARI

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1. (a) The Questions presented for review:

(i) Does an admittedly novel and nonobvious physical computer element constitute patentable subject matter under 35 U.S.C. 101?

(ii) Does a mathematical formula of a type presenting no "mathematical problem" fall within the Supreme Court definition of an "algorithm"? (Benson Decision)

(iii) Can the United States Court of Appeals for the Federal Circuit properly disregard the requirement of 35 U.S.C. 144 that an opinion shall be rendered on appeals from the Patent and Trademark Office?

1. (b) Parties to the Proceeding in the U.S. Court of Appeals for the Federal Circuit:

Ralph E. Bucknam - Appellant
Commissioner of Patents and Trademarks – Appellee.

1. (c) Table of Contents and Table of Authorities:

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1. (d) Official Reports by the Board of Patent Appeals and Interferences:

- (i) Decision on Appeal in Application Serial No. 316,471.
- (ii) Decision on Request for Reconsideration in same Application.
- (iii) Decision on Appeal in Application Serial No. 409,887.
- (iv) Decision on Request for Reconsideration in same Application.

1.(e) Grounds on which Jurisdiction is invoked:

- (i) Judgement entered July 19, 1991.
- (ii) Rehearing denied September 10, 1991.
- (iii) Statutory authority for review:
28 U.S.C. 1254 Sec. 1.

1.(f) Statutes, Rule and Court Definition involved:

Statute: 35 U.S.C. 101 Inventions patentable Pages 10,(viii)

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefore, subject to the conditions and requirement of this title.

35 U.S.C. 144 Decisions on Appeal *Pages 7 and 8*

The United States Court of Appeals for the Federal Circuit shall review the decision from which an appeal is taken on the record before the Patent and

Trademark Office. Upon its determination the court shall issue its mandate and opinion which shall be entered of record in the Patent and Trademark Office and shall govern the further proceedings in the case.

Rule: Federal Circuit R. 36 Entry of judgement Page 7

The court may enter a judgement of affirmance without opinion, citing this rule, when it determines that any of the following circumstances exist:

(a) the judgement, decision or order of the trial court appealed from is based on findings that are not clearly erroneous;

(b) the evidence in support of a jury verdict is sufficient;

(c) summary judgement, directed verdict, or judgement on the pleadings is supported by the record;

(d) the decision of an administrative agency warrants affirmance under the standard of review in the statute authorizing the petition for review; or

(e) a judgement or decision has been entered without an error of law; and an opinion would have no precedential value.

Definition: Benson case—Supreme Court:Pages 1,7,8,11

“A procedure for solving a given type of mathematical problem is known as an 'algorithm'.”
Gottschalk v. Benson, 409 U.S. 63 at 65 (1972).

1. (g) Statement of Case.

The appeal to the U.S. Court of Appeals for the Federal Circuit comprised consolidation of two patent cases each presenting the same question of whether they claim patentable subject matter. It is adequate simply to consider the broadest claim of U.S. Patent Application Serial No. 316,471 which reads as follows:

"Claim 1. An improved computer memory device for eliminating the inaccuracy inherent in trigonometric functions, comprising means for causing the computer to generate a signal in the form

$$\cos B = \frac{2!}{2! + B^2}$$

and means for causing a computer to generate a signal in the form

$$\sin B = \frac{3! B}{3! + B^2}$$

where B is in radians ranging between 0 and $\sqrt{2}$ and COS B and SIN B represent non-inertial trigonometric values."

The Patent and Trademark Office ground for rejection is most succinctly stated in the following language of the Board of Appeals in its rejection of Rehearing:

"Appellant seems to take a narrow reading of the term "algorithm" and implies that his *equa-*

tions are not algorithms because they are not steps in an overall solution to a problem. We disagree”.

Petitioner explained to the U.S. Court of Appeals that, in this instance, the two formulae recited in the claim each merely represents a mathematical shorthand substitute for exact tables presenting no mathematical problem. It was explained that the tables, in turn, define precise physical characteristics of a discrete computer element identified in the above claim as a “memory device”.

The U.S. Court of Appeals affirmed the decisions of the Patent and Trademark Office and refused rehearing, both without opinion under the authority of the above Federal Circuit Rule 36. The question is now asked as to whether this is proper in view of 35 U.S.C. 144.

1.(i) Basis for Jurisdiction in the U.S. Court of Appeals.

35 U.S.C. Sec 141

28 U.S.C. Sec. 1295 (a) (4) (A)

1.(j) Argument.

At the heart of the problem is the difference between patenting a discrete element, on the one hand, and patenting a process or apparatus, on the other hand. This distinction is of very timely and very far-reaching importance in the computer field.

So far as Petitioner can ascertain, the only court reference to this problem to date is the following:

"If appellants were claiming the information embodied in the firmware or the firmware itself, per se, a different case would be presented. We express no opinion on the statutory nature of such invention, a question not before us". *In re Bradley*, 600 F.2d 807, 202 USPQ 480 at 485 (CCPA 1979), aff'd. *Diamond v. Bradley* 450 U.S. 381 (1981).

The basis for the important distinction pointed out above is that process and apparatus claims involve interrelated steps or cooperating elements, whereas a single discrete element does not. The Patent and Trademark Office has been able to produce no decision applying the "algorithm" problem to a single element. In the realm of process and apparatus claims there is the following well-known two-step "Freeman" test:

First, it must be determined whether the claim directly or indirectly recites an "algorithm" in the Benson sense of the term ***

Second, the claim must be further analyzed to ascertain whether the algorithm is applied in any manner to physical elements or process steps, provided that its application is circumscribed by more than a field of use limitation or non-essential post-solution activity. *In re Abele*, 684 F. 2d 902, 214 USPQ 682 at 686 (CCPA 1982).

The entire thrust of all of the cited decisions has been directed to the interplay of mathematics among such related steps of a process or cooperating elements of an apparatus. Lacking decisions specific to using an exact table or corresponding replacement shorthand formula to describe a discrete element the best the Patent and Trademark Office has been able to do is to torture this two-step test in an effort to extend it to this new field. In these

circumstances, it has been clearly improper for the U.S. Court of Appeals to have shirked its responsibility to render a careful thoroughly reasoned opinion on this important new question of law.

Actually, the record shows that at the hearing before the Court the Patent Office Solicitor in fact acknowledged that a computer element per se qualifies as patentable subject matter. He used such expressions as "If it were imbedded in some piece of hardware ...", "If there were sufficient structure in the claims ..." and "As long as you limit it to a physical element ...". This important breakthrough in patent law was called to the Court's attention in the Request for Rehearing, and it certainly should have been made of record by the Court in an opinion. It obviously answers the *In re Bradley* question! Thus, in reality, the only question yet to be decided is whether a shorthand formula merely substituted for an exact table and having no other use falls under the Supreme Court definition of an algorithm.

When the Patent Office Board of Appeals in its decision and the U.S. Court of Appeals during oral discussion (as shown by the record) have insisted on using the word "algorithm" loosely as though no question had been raised as to its true definition, the precise question before these tribunals has clearly been "begged".

What precisely will be gained if the Supreme Court takes action? Patent protection for computer inventions can be identified as a three-legged structure, (a) protection of a process, (b) protection of an apparatus, and (c) the new concept of protecting a discrete physical computer element such as a unique memory device or firmware having novel and non-obvious information embedded therein. Petitioner has shown two important discrete elements of this type in his patent applications. They are not interrelated in the

“apparatus” sense. Subsequent work has brought to light a sequence of “bridging” independent discrete elements. The assembly comprises what may be termed a “non-inertial” computer, the use of which can be appropriately explained in terms of fluid mechanics. At present, the mathematics in this field is very poor, and one must resort to empirical techniques. The determination, for example, of the “mathematical history” of particles of different densities in a complex fluid system is at present beyond the reach of mathematicians. With the “non-inertial” computer, (as is being evidenced by work now in progress), it will be possible to track each particle mathematically. This new technique appears to be extendable to many other fields from the atom to celestial bodies. Petitioner has just completed the mathematical analysis and has now filed a patent application on this over-all development. (Serial No. 790,339 filed Nov. 12, 1991)

In the recent *In re Iwahashi* decision, 888 F.2d 1370 (Fed. Cir. 1989) the presence of squaring information embedded in a memory device rendered an apparatus claim patentable. Had this been some novel and unobvious information, one should have been able to patent the memory device per se. It will be found that there are many, many instances where some unique new physical characteristic is embedded in a memory device or other firmware, thus enabling the computer to accomplish something it could never otherwise accomplish; and it will be a great step forward in the computer art if the Court now recognizes that this falls clearly within 35 USC 101.

Petitioner urges that, as summary disposition, the Supreme Court should remand this matter with clear instruction for the U.S. Court of Appeals to rehear the case fully and carefully, preferable with a “blue ribbon” Panel formed of judges most knowledgeable in patent law and to

render a proper opinion which, if circumstances require, can ultimately be reviewed by the Supreme Court. It is respectfully submitted that, in this particular instance, perhaps understandably considering the complex nature of the subject matter, by failing to render a proper opinion on these fundamentally new questions of law, the U.S. Court of Appeals for the Federal Circuit "has so far departed from the accepted and usual course of judicial proceeding as to call for an exercise of the Supreme Court's power of supervision". (Supreme Court Rule 10.1(a)).

[Note: In the third paragraph of Page xiii of the present appendix the Board of Appeals on its Rejection on Rehearing has acknowledged that Petitioner's interpretation of the question pertaining to the definition of an "algorithm" presented herein might be found correct but, as a safeguard, has introduced a new issue having no bearing on the three questions presented herein. For completeness, an explanation is appropriate: The new issue is that the claims are not patentable because Petitioner's new computer element constitutes "a fundamental *tool* of scientific inquire" (emphasis added). While the board has not specified the relevant decision, this obviously is based on the following Supreme Court language:

"Phenomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work".

Gottschalk v. Benson, 409 U.S. 63 at 67 (1971).

Here the word "tools" is used figuratively. Petitioner disposed of this contention in his brief to the U.S. Court of Appeals by explaining that, as an example, while a logarithmic system is clearly not patentable, a device such as a slide rule for manipulating logarithms is.]

1.(k) Appendix.

(i) Order on rejection:

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

91-1212-1213

IN RE RALPH E. BUCKNAM

JUDGEMENT

ON APPEAL from the United States Patent and Trademark
Office

Board of Patent Appeals and Interferences
in CASE NO (S). 07/409,887 and 07/316,471

This CAUSE having been considered, it is ORDERED and
ADJUDGED:

PER CURIAM (ARCHER, MAYER and RADER,
Circuit Judges).

AFFIRMED. Fed Cir. R. 36

(signed) Francis X. Gindhart, Clerk
DATED July 19, 1991

(ii) Decisions of Patent and Trademark Office:

(Note: The Rejection and Refusal of Rehearing in Serial
No. 409,887 are practically repetition of what follows and
are therefore omitted. Also, the patent documents, which
are complex, have been omitted since the material in this
Petition is deemed adequate for an understanding of the
problem.)

PATENT OFFICE REJECTION

No. 90-2318

Mailed: October 31, 1990

Appeal No. 90-2318

HEARD: October 3, 1990

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex Parte RALPH E. BUCKNAM

Application for patent filed February 27, 1989,
Serial No. 07/316,471 Non-inertial Trigonometry Firm-
ware and Software.

Ralph E. Bucknam, *pro se*.

Primary Examiner – Lawrence E. Anderson

Before Lindquist, Martin and Stewart,
Examiners-in-Chief.

Stewart, Examiner-in-Chief.

This is a decision on the appeal under 35 USC 134
from the examiner's rejection of claims 1-4 and 10-13, all
of the claims remaining in the application.

The disclosure relates to a system of mathematics
which permits, according to appellant, the exact solution of

certain problems in the field of theoretical mechanics, including quantum mechanics. These problems include the classical pendulum problem and the N body problem. Appellant provides an explanation for certain relationships which exist in orbital mechanics. Central to the system of mathematics is appellant's revised values for the "sine" and "cosine" trigonometric functions. The claims are directed to "an improved computer memory device" containing the revised functions and to "an improved computer program" which utilizes those functions.

Claim 1, which is representative of the claimed subject matter, reads as follows:

1. An improved computer memory device for eliminating the inaccuracy inherent in trigonometric functions, comprising means for causing the computer to generate a signal in the form

$$\text{COS } B = \frac{2!}{2! + B^2}$$

and means for causing a computer to generate a signal in the form

$$\text{SIN } B = \frac{3!}{3! + B^2}$$

where B is in radians ranging between 0 and $\sqrt{2}$ and Cos B and SIN B represent noninertial trigonometric values.

The reference of record relied on by the examiner is:

Booth et al (Booth), *Computing: Fundamentals and Applications*, Hamilton Publishing Co., 1974 New York, pages

2-15 and 234-237.

Claims 1-4 and 10-13 stand rejected under 35 USC 101 as drawn to nonstatutory subject matter.

Claims 1-4 and 10-13 stand rejected under 35 USC 112, second paragraph, as indefinite.

Claims 10-13 stand rejected under 35 USC 103 as unpatentable over Booth.

Rather than reiterate the arguments of appellant and the examiner, reference is made to the brief and examiner's answer for the respective details thereof.

OPINION

We have carefully reviewed the record in this appeal and, as a result thereof, we find that we agree that the claims are nonstatutory. However, we disagree that the claims are indefinite for the reasons stated by the examiner. We find claims 10-13 to be unobvious over the prior art. Finally, we enter a new ground of rejection under the second paragraph of 35 USC 112, with respect to claims 1-4, 11 and 12.

We will turn first to the issue of whether the claims are statutory.

Although mathematical algorithms *per se* are non-statutory, as stated in *Diamond v. Diehr*, 450 U.S. 175, 101 S. Ct. 1048, 209 USPQ 1 (1980):

[A] Claim drawn to subject matter otherwise statutory does not become non-statutory simply because it uses a mathematical formula, computer program, or digital computer...

[I]n *Parker v. Flook*... we stated, "A process is not unpatentable simply because it contains a law of nature or a mathematical algorithm." 437 U.S. at 590. It is now common place that an application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection.

There is thus the distinction between mathematical algorithms which are the basic tools of scientific and technological work and the technological application of scientific principles and mathematical algorithms which further the constitutional purpose of promoting "the progress of science and the useful arts."

The proper legal analysis of mathematical algorithm/statutory subject matter cases is the 2-part test of *In re Freeman*, 53 F. 2d 1237, 197 USPQ 464 (CCPA 1978) as modified by *In re Walter*, 618 F.2d 758, 201 USPQ 397 (CCPA 1980) and *In re Abele*, 684 F.2d 902, 214 USPQ 682 (CCPA 1982).

First we will determine whether the claims directly or indirectly recite an algorithm. Each of the claims under appeal contains functional expressions which relate "COS B" and "SIN B" either to a fixed expression or to an infinite series. These expressions are clearly mathematical in nature and we therefore conclude that the claims contain mathematical algorithms, thus satisfying the first part of the test.

In *Abele*, the CCPA modified the second part of the test to require:

that the algorithm be "applied in any manner to physical elements or process steps", provided that its application is circumscribed by more than a field of use limitation or nonessential post-solution activity.

Thus, if the claims would be "otherwise statutory" ...albeit inoperative or less useful without the algorithm, the claim likewise presents statutory subject matter when the algorithm is included.

In considering whether each of appellant's claims, viewed in its entirety, is directed essentially to a mathematical algorithm, we consider the extent to which the mathematical parts of the claims interact with non-mathematical physical elements or process steps. One way of performing this analysis is to begin by considering what remains when the mathematical portions of the claims are removed.

If one were to consider claim 1 with the mathematical expressions removed, all that would remain is a computer memory device. The only thing which distinguishes the computer memory device from prior art computer memory devices resides in the mathematical expressions. With respect to claim 10, when the mathematical expressions are removed, all that remains is a computer program.

In the claims, the algorithms do not interact in any way with physical elements or process steps. The claims do not preempt all uses of the mathematical algorithm, because the algorithm can still be performed with pencil and paper. However, the claims, if patented, would bar any effective use of the algorithm by essentially preempting all uses of computer implementation of the algorithm. More fundamentally, the nonalgorithmic parts of the claims represent only the medium upon which the mathematical algorithms are stored. In one instance the algorithms are stored in memory. In another, they are stored as a part of a computer program. The algorithms recited don't do anything. They do not interact with other processes which, in and of themselves, might be statutory; they do not interact with the physical world in any way. What we have is a classic case of data being claimed *per se*. It is admittedly claimed in conjunction with the storage medium. But that is no different from claiming printed matter in conjunction with paper upon which it is printed.

We do not view *In re Iwahashi*, 888 F. 2d 1370, 12 USPQ 1908 (Fed.Cir. 1989) as sanctioning patentability of a memory device and data, *per se*. *Iwahashi* involved "apparatus in the form of a combination of interrelated means" (12 USPQ 2d at 1911, col. 2). Here the claims recite only memory and data.

We do not ignore the data stored in memory any more than one can delete printed matter from a claim and

declare the rest unpatentable. It must be considered, but it may be given zero weight once it has been evaluated. The "critical question is whether there exists any new and unobvious functional relationship between the printed matter" (data) and the rest of the invention. *In re Gulack*, 703 F. 2d 1381, 217 USPQ 401 (Fed. Cir. 1983). The fact that the claims are in an apparatus form, which implicitly links the mathematical algorithm to performance on a programmed digital computer, does not convince us that the claims are statutory any more than similar facts, which failed to convince the court *In re Grams*, 888 F. 2d 835, 12 USPQ 2d 1824 (at 1829) (Fed.Cir. 1989).

As indicated above, the data claimed does not interact with the physical world. There is no functional relationship. Against this background, we conclude that the claims, considering the subject matter as a whole, represents mathematical algorithms within the meaning of the cases cited and are therefore drawn to nonstatutory subject matter.

Appellant has argued that since potentiometers which have resistance characteristics which correspond to a functional relationship can be patented as articles of manufacture then clearly the digital equivalent (in the form of, e.g. read only memory (ROM)) which contains the same functional relationship can be patented. Appellant's argument has a superficial appeal, however, we do not have before us a claim for a potentiometer. We do not need to decide whether a potentiometer which differs from the prior art only in the functional relationship defined by a mathematical algorithm would be statutory.

After considering all the arguments, we conclude that the claims in question are nonstatutory within the meaning of 35 USC 101. Accordingly, we will sustain the examiner's rejection.

With respect to the rejection under 35 USC 112, second paragraph, the examiner has objected to the term "non-inertial". In each case where the term is used, the functions "COS B" and "SIN B" are expressly defined mathematically. Therefore, the reference to "non-inertial" represents merely appellant's short hand for referring to the method by which the relationships were derived. We do not consider the claim language to be indefinite because of the inclusion of the term "non-inertial".

We hereby enter a new ground of rejection under the provisions of 37 CFR 1.196(b).

Claims 1-4, 11 and 12 are hereby rejected under 35 USC 112, second paragraph, as misdescriptive and inaccurate. With respect to claim 1, the phrase "for eliminating the inaccuracy inherent in trigonometric functions" is misdescriptive. The definitions of the classical trigonometric functions (represented in lower case to distinguish them from appellant's functions which are represented in upper case), cosine ("cos") and sine ("sin"), are exact in terms of ratios of one side of a right triangle to a different side. There is no inaccuracy in such a definition. Infinite series expansions are utilized to represent or calculate values for the functions. It is not clear that appellant's revised functions will eliminate such inaccuracies.

What appellant has really done is define a completely new set of functions, which he calls "COS B" and "SIN B". When solving certain classes of problems, appellant's functions appear to have substantially improved behavior over the classical cosine and sine functions. Appellant is not correcting the classical sine and cosine functions. Appellant is replacing them with functions which, for particular problems, result in a natural representation which facilitates an exact solution. Appellant's SIN and COS functions are related only to the classical sine and

cosine functions in that they are used somewhat similarly in the problem solution and in that they are derived from examination of the behavior of the classical sine and cosine functions.

To the extent indicated, the language of appellant's claim 1 misdescribes what the SIN and COS functions are.

With respect to claims 2, 3, 11 and 12, each of the claims contains an infinite series. In the definition of that infinite series, the n th order terms (the right hand term) of each equation does not correctly summarize the progression of the terms. The denominator, in each case should have the factorial expression raised to the $(n-1)$ th power.

Accordingly, we consider the claims to be inaccurate and misdescriptive and, as failing to comply with the requirements of 35 USC 112, second paragraph.

Turning to the rejection under 35 USC 103, the Booth reference shows the use of a truncated infinite series to represent the classical sine function and discusses the sources of error which occur in the series approximation.

Basically, the Booth reference has nothing whatsoever to do with the generation of appellant's COS B and SIN B functions. The expressions which appellant uses to calculate his value for COS B and SIN B bear only the limited relationship to the classical cosine and sine functions described above. Therefore, at the least, appellant's functional relationships would not have been obvious over the definition given in the Booth reference.

Accordingly, we will not sustain the rejection under 35 USC 103.

In summary, we sustain the rejection of claims 1-4 and 10-13 under USC 101 as drawn to nonstatutory subject matter. We reverse the rejection of claims 1-4 and 10-13

the inclusion of the term "non-inertial". We have entered a new ground of rejection under 35 USC 112, second paragraph, with respect to claims 1-4, 11 and 12. Finally, we have reversed the rejection of claims 10-13 under 35 USC 103.

The decision of the examiner is affirmed.

AFFIRMED,
37 CFR 1.196(b)

Signed:

William F. Lindquist
Examiner-in-Chief

John C. Martin
Examiner-in-Chief

David L. Stewart
Examiner-in-Chief

} BOARD OF
PATENT
APPEALS
AND
INTERFERENCES

REJECTION ON REHEARING

Appeal No. 90-2318

Mailed: Feb. 12, 1991

Heard: October 3, 1990

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex Parte Ralph E. Bucknam

Application for patent filed February 27, 1989,
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ware and Software.

Ralph E. Bucknam, *pro se*.

Primary Examiner - Lawrence E. Anderson

Before Lindquist, Martin and Stewart,
Examiners-in-Chief.

Stewart, Examiner-in-Chief

ON REQUEST FOR RECONSIDERATION

This is a decision on the request, filed November 26, 1990 for reconsideration of our decision of October 31, 1990, which was remailed on November 20, 1990, in which we reversed certain rejections but sustained rejections holding the claims nonstatutory.

We have reviewed in detail the points raised by appellant but find nothing therein which we have not adequately addressed in our original decision. Appellant seems to take a narrow reading of the term "algorithm" and implies that his *equations* are not algorithms because they are not steps in an overall solution to a problem. We disagree. An equation is a mathematical description of a process for calculating one value based on other values. In that sense, a single equation clearly describes an algorithm.

Even if one were to accept appellant's reading of the term "algorithm", one cannot deny that the normal trigonometric functions are the fundamental tools of scientific inquiry. To the extent that appellant's equations purport to replace those trigono-metric functions, they too should be considered a fundamental tool of scientific inquiry. The cases referred to in our original decision support the conclusion that such fundamental tools of scientific inquiry are beyond the scope of patent protection.

Accordingly, appellant's request for reconsideration is granted to the extent that we have reconsidered our earlier decision, but is denied with respect to making any changes therein.

DENIED

(Same signatures as in Rejection.)

(iii) Order on Rehearing

UNITED STATES COURT OF APPEALS FOR THE
FEDERAL CIRCUIT

REVISED: 09/26/91

91-1212-1213

IN RE RALPH E. BUCKNAM

ORDER

Before ARCHER, Circuit Judge, MAYER, Circuit Judge and RADER,
Circuit Judge.

A petition for rehearing having been filed in this case,

UPON CONSIDERATION THEREOF, it is ORDERED
that the
petition for rehearing be, and the same hereby is, denied.

The mandate will issue on September 17, 1991.

FOR THE COURT

(signed) Francis X. Gindhart
Clerk

Dated: September 10, 1991

* * * * *

This Petition signed:


Ralph E. Bucknam, Attorney of Record

